Space Science Seminar
THURSDAY, 2015 March 12
10:45 a.m.
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Cosmological and Astrophysical Signatures of Dark Matter

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Host: Dr. Nasser Barghouty (sponsored by ZP12)

Dark matter was discovered 1933 by F. Zwicky in clusters of galaxies. Today we know that dark matter is most of the matter in the universe, and we do not know what it is. Particle Physics suggests that it could be a heavy particle, and it could be produced in the right quantity. Astronomy suggests that it is a light particle, from simple phase space arguments of old compact galaxies. If the first approach is correct, then the particle ought to be visible in some strange interaction, producing odd positrons, neutrinos, *etc*. Many unexpected photons, positrons, and other emissions have been detected, but none of them securely point to anything unusual. All can be readily explained with normal star explosions; one just has to think about stars a bit more. If the second approach is correct, then of course things are even more difficult. One particle physics candidate for the second approach is a sterile neutrino. If this idea is realized in Nature, then we may have a chance to detect it via a decay yielding an X-ray photons: there are conflicting claims on whether these photons have been detected. However, if the claimed X-ray detection is true, then these particle must have a non-thermal phase-space distribution to explain both dwarf elliptical galaxies and the claimed X-ray detection. One other aspect of these keV right handed neutrinos is that they define a minimum mass of the early clumps in the early universe, and they also allow strong star formation in the early universe. In combination, they may support the formation of the first super-massive black holes in the universe.

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